

List of Projects Available for the PDF Positions in 2026A

1. Proposer: Dr. Manish Naja

Proposal ID: 2026A1

Title 1: Trace Gases studies over the Central Himalayas and related regions

Brief Outline: This project aims to use surface observation of several trace gases, along with setting/applying high-resolution regional chemistry model (e.g. WRF-Chem) simulations, to investigate the chemical transformation and transport of trace gases and assess the role of meteorology and dynamics.

Essential requirement: Experience in regional chemistry models.

OR

Proposal ID: 2026A2

Title 2: Vertical distribution of Trace Gases over the Central Himalayas

Brief Outline: The vertical distribution of different trace gases will be studied using a regional chemistry model (e.g. WRF-Chem). The balloon-borne observations of ozone, ground-based remote sensing observations from MAX-DOAS/PANDORA, and data from space-borne sensors will also be used.

Essential requirement: Experience in regional chemistry models.

2. Proposer: Dr. Indranil Chattopadhyay

Proposal ID: 2026A3

Title 1: Simulations of accretion-ejection systems around black holes

Brief Outline: Advective transonic accretion around black holes is a very robust accretion model. This class of solutions admits all possible features. In this project, we would like to investigate these phenomena in 3-dimensional high-resolution simulations, in the presence of general radiative cooling and viscosity, and for the relativistic equation of state for the plasma.

OR

Proposal ID: 2026A4

Title 2: Morphology of relativistic Jets

Brief Outline: Relativistic jets from quasars come in various shapes, which also influences various classifications of radio galaxies. We would like to explore how entrainment and plasma composition may account for the variation of morphology using three-dimensional high-resolution hydrodynamic and magnetohydrodynamic simulations.

3. Proposer: Dr. Santosh Joshi

Proposal ID: 2026A5

Title: Spectroscopic Tracking and Abundance Research Survey of Chemically Peculiar stars (STARS-CP)

Brief Outline: The proposal intends to perform the asteroseismic investigation of the main-sequence B-F stars using the data from the ground and space-based facilities, such as 3.6 m DOT (existing ADFOSC, TANSPEC) and upcoming HRS, respectively. The combined photometry and spectroscopy will be used to probe the interiors and evolutionary status of the selected samples using the asteroseismic technique.

Experience: Candidates with working experience in stellar variability and analysis of the time-resolved photometric data (e.g. TESS) and low/medium/high-resolution spectroscopic data are encouraged to apply.

4. Proposer: Dr. Yogesh Joshi

Proposal ID: 2026A6

Title: Understanding Galactic Structure using Open Star Clusters

Brief outline: Open clusters spanning a wide range of ages will be observed using the ARIES telescope, complementing the existing GAIA dataset for these systems. These clusters will serve as a valuable tool for investigating stellar variability, initial mass function, dynamical properties, and Galactic Structure.

Essential requirement: Dealing with a large volume of archival data and good knowledge of python programming.

OR

Proposal ID: 2026A7

Title: Exoplanet demographics and characterisation of planetary atmosphere through transmission spectroscopy

Brief Outline: During a planetary transit, light from the host star passes through the planet's upper atmosphere before reaching the observer. The primary objective of this exoplanet research proposal is to carry out ground-based photometric and spectroscopic observations of hot Jupiters in order to investigate their atmospheric properties using transmission spectroscopy.

Essential requirement: photometric and spectroscopic ground-based observations

5. Proposer: Dr. Kuntal Misra

Proposal ID: 2026A8

Title: A Systematic Time-Domain Study of Variable Stars with the International Liquid Mirror Telescope

Brief outline: This project will use data from the 4-m International Liquid Mirror Telescope (ILMT) to identify and characterise variable stars and transients through its deep, high-cadence observations. Detailed modelling and multi-wavelength data will be used to derive physical properties, with follow-up spectroscopy from the 3.6m DOT for selected sources.

Essential requirement: Candidates with experience in time-domain research in optical wavelengths, particularly in transients, are encouraged to apply.

6. Proposer: Dr. U. C. Dumka

Proposal ID: 2026A9

Title 1: Assessment of Polycyclic Aromatic Hydrocarbons (PAHs) and Their Health Impacts in the Himalayan Ecosystem

Brief outline: The current study aims to examine the chemical composition, source apportionment, and oxidative potential of particulate matter (PM) in the climatically sensitive Himalayan region. Using high-volume air samplers, this study will provide critical insights into aerosol characteristics that influence regional climate, air quality, and human health in the most vulnerable mountain ecosystem.

OR

Proposal ID: 2026A10

Title 2: Role of Brown carbon and HULIS in climate forcing and human oxidative stress

Brief outline: In the current study, we examine the roles of brown carbon (BrC) and humic-like substances (HULIS) in relation to climate forcing and human oxidative stress, focusing for the first time on the ecosensitive high-altitude Himalayan region in India within a comparative framework. The main objectives of the current proposal are:

- 1) To characterize the BrC and HULIS in fine-mode aerosols over Devesthal, a high-altitude remote location in the central Himalayas.
- 2) Investigate the seasonality, source, and transport pathways of BrC and HULIS, affecting their climate forcing and human health.

7. Proposer: Dr. Krishna Prasad

Proposal ID: 2026A11

Title: Dynamics of MHD Waves and flows in the Solar atmosphere

Brief outline: The main goal of this project is to investigate the dynamics of magnetohydrodynamic (MHD) waves and various plasma flows in the solar atmosphere using data from cutting-edge observatories like Solar Orbiter, Proba-3, Aditya-L1, and DKIST. By employing solar magneto-seismology and advanced numerical simulations. Spectroscopic data from VELC/Aditya-L1 will be particularly utilized to analyze the coronal dynamics.

8. Proposer: Dr. Priyanka

Proposal ID: 2026A12

Title 1: Greenhouse Gas Modelling and Budget Assessment over the Central Himalayas

Brief Outline: We aim WRF-Chem regional transport modelling — evaluated against ARIES's long-term continuous CO₂, CH₄, N₂O, and CO surface record, boundary layer meteorological profiles, and GOSAT/OCO-2/TROPOMI satellite column retrievals — to

investigate GHG transport pathways, source–sink attribution, and monsoon-driven variability over the central Himalayan domain.

Essential Requirement: Knowledge and experience regional chemistry modelling, GHG modelling and inverse modelling (desirable)

OR

Proposal ID: 2026A13

Title 2: Atmospheric Dynamics and Meteorological Processes over the Central Himalayas Using VHF Radar

Brief Outline: We aim to make continuous observations from ASTRAD, India's first high-altitude VHF wind profiler at ARIES Nainital, to investigate wind structure, wave activity, turbulence, and convective dynamics spanning the troposphere and lower stratosphere. It will provide a better understanding of mountain–atmosphere interactions and their role in South Asian weather and climate variability.

Essential Requirement: Knowledge and experience of RADAR data analysis , WRF modelling with AI/ML

OR

Proposal ID: 2026A14

Title 3: Aerosol Modelling and Radiative Impact Assessment over the Central Himalayas

Brief outline: We propose to use WRF-Chem aerosol simulations — evaluated against ARIES's long-term AOD, black carbon, aerosol scattering/absorption, and offline chemical composition records, alongside satellite (MODIS, CALIOP, etc), and reanalysis model (MERRA-2, ERA5, etc.) products — to investigate aerosol transport, optical properties, and direct radiative forcing over the Himalayan domain.

Essential Requirement: Knowledge and experience of aerosols data analysis, WRF Chem modelling with AI/ML